# EFFICIENCY THROUGH SCIENCE

Talk by Dr. Byron T. Shaw, Administrator, Agricultural Research Service, U. S. Department of Agriculture, at the dedication of the new Snake River Conservation Field Station, Twin Falls, Idaho, May 26, 1964.

It's like coming home for me today. I grew up on a ranch over near Malta and attended high school at Burley -- which in those days was the arch rival of Twin Falls, and I suppose still is.

Understandably, it gives me particular pleasure to dedicate the Snake River Conservation Field Station. I know that you share my pride in this new research facility.

I know the farming problems here from first-hand experience. I've picked up potatoes, topped beets, and herded sheep. I've harnessed 8 to 10 teams of horses every morning.

But what I see today is vastly different from what I remember. You have moved from horses to full mechanization. You have vastly superior crop varieties. You have fertilizer materials and techniques that were unavailable until a few years ago.

With all of these changes, one might conclude that our problems are solved. But that's far from true. Science must devise ways of making more efficient use of our soil and water resources if the Snake River Valley is to remain prosperous.

Anyone who has herded a stream of water over a farm knows that irrigation farming is different. The irrigation farmer has the difficulties facing all farmers. And in addition, he must buy his water. He must control and use it efficiently in order to make a profit. Therefore, he must farm <u>better</u> than the man on the dryland.

In common with other farmers, he likewise faces rising costs. The price of machinery has increased almost a third in the past 10 years. Wages paid hired hands have also risen by a third, and other things farmers buy are more expensive. The investment in farm land and buildings has doubled in a decade.

This conservation field station is charged with developing the technology for making agriculture more profitable in this time of rising costs. It will be a team effort, involving many scientific disciplines. Here the scientists of the Agricultural Research Service, the University of Idaho, and the Weather Bureau will be working side by side, sharing the knowledge and skills each has at his disposal.

Irrigation agriculture faces increased competition for the right to use water -- from municipalities, industry, and recreation. Agriculture can expect to inherit irrigation water of lower quality in the future, as the competition for the limited supply increases. Restrictions on both

the quantity and quality of water for agriculture will consequently dictate more efficient water use.

The competition for water faced by agriculture has its parallel in the competitive situation of most manufacturers. The very survival of an industrial plant may depend on efficient use of raw materials and economical production methods. And his product must suit the customer. Research is the key to his survival and progress.

Similarly, agriculture must have less costly ways of collecting, diverting, and applying water. It needs less expensive, better equipment for handling water. It needs more automation to reduce labor costs. And it must constantly improve the quality of its product -- whether it is potatoes, grain, or meat.

Let us examine some ways research can improve the competitive position of irrigation agriculture.

Every irrigation farmer needs technical guidance in making the best use of water -- whether his supply is limited or adequate. Many of you here in the Snake River Valley know how difficult it is to stretch a short water supply. This laboratory will investigate what crops to grow, how much water to apply, and when to irrigate if water is limited.

We need studies here like one our scientists recently completed in the Texas Panhandle. They found that grain sorghum -- an important crop in Texas -- will produce good yields most years with half the amount of irrigation water that is customarily used. Before we can recommend similarly efficient irrigation methods here, we must have detailed local information on the soils and crops.

Parts of this valley normally have enough irrigation water early in the season but cannot store it for late-summer use. Consequently, we must learn how to make early-summer irrigations carry the crops through to harvest.

Even where the water supply is adequate to abundant, doing an efficient job of irrigating is difficult. The tendency is to use too much water, and overirrigation leaches out nutrients, turns good farmland into seep areas, and creates salinity problems. Research on water management is clearly needed.

We also have only meager information on how to maintain and efficiently use the ground water many of you depend on for irrigation. We need to know how much of the irrigation water percolates down and is added to the underground supply, how this water moves, and where it goes.

Regardless of the amount of water available, it should be moved from its source to the field with minimum loss. According to best estimates, seepage from leaky canals and ditches wastes a fourth to half of the water diverted. Two problems are involved -- locating where the loss occurs, and finding low-cost methods of sealing the canals.

You can imagine the difficulties involved in measuring the seepage through the sides and bottom of a canal filled with water. But we now have an experimental procedure for doing just that, and it should help us locate these seepage trouble spots.

Our scientists have made commendable progress in developing low-cost canal linings. We are trying asphalts, plastic films, and butyl membranes. Some of them are about as efficient as concrete, but much less expensive. We still don't have the full story on how long they will last.

Once the irrigation water arrives at the farmer's turnout, he must have a simple and accurate way of measuring how much water he is getting. Only then can he plan how to use it efficiently. Two recent developments hold much promise.

One is a trapezoidal flume that can be made an integral part of a concrete irrigation channel. It is nearly trouble-free, is not easily obstructed by debris in the water, and is readily adapted to measuring small or large flows of water.

The other is a deceptively simple and inexpensive metering device designed by one of our engineers in Utah. It consists of a length of flexible tubing attached to an opening in a canvas dam across the canal. The diameter and length of the tube determine the amount of water admitted to the farmer's ditch. The metergate is closed by simply raising the tube and laying it over the top of the dam.

When you tour the laboratory, in a few minutes, you will see how we are studying water movement into and through the soil. This is representative of the basic research we expect to do here. Before we can recommend the length of irrigation run and frequency of water application, we must understand how fluids flow through porous material, such as soil.

You will see how we are taking the guesswork out of fitting sprinkler irrigation equipment to individual farm conditions. We have had no practical way of estimating the water-intake rate of the soil, to determine the number and spacing of the sprinkler heads. If the designer underestimated the intake rate, it took a longer run or more equipment -- either of which was costly. If he overestimated the intake rate, water was wasted. Now we have a portable device with which we can accurately measure the intake rate where the sprinkler system is to be installed.

I know you will be interested in the automated irrigation equipment our engineers are designing. You will see automated gates and checks in the laboratory flume, which simulates an irrigation ditch. These studies have been hampered by lack of suitable equipment, but now we can press forward with this research.

With skilled irrigators hard to hire at any price, I am sure you will welcome the time when you can set your water -- then go about your duties with the assurance that the job will be done properly.

There's a big research job ahead of us in determining the best way of applying irrigation water to fields. The Snake River Valley produces a wide variety of crops, each with its own growth habits and moisture needs. And the soils of the $2\frac{1}{2}$ million acres of irrigated land vary widely in water-holding capacity.

In addition, we must improve the management of irrigated land. What are the best tillage and fertilization practices? What is the most desirable row spacing and row direction? We look to this laboratory for the answers.

Another management decision we face is what to do with crop residues. For example, you know it is difficult to grow beans after wheat -- even if you burn the stubble. We don't know why. This is a job for the soil microbiologists. They will investigate the influence of irrigation and fertility practices on soil microflora, in soils differing in texture and organic matter content.

Up to now, much of our attention has been focused on the effect of water management on yield. Now we must give greater emphasis to the effects of different irrigation frequencies and amounts on crop quality. With high-value potatoes, beans, sweet corn, and seed crops, quality is of paramount importance.

Solving the problems of irrigation farming is only part of our broad effort to make American agriculture more profitable. We must develop better crop varieties, control diseases and pests more effectively, and constantly improve the breeding and management of our livestock. Let me tell you about some of our research in these areas -- particularly as it affects the Pacific Northwest.

Tailoring our crops to the requirements of food processors is a constant challenge to plant breeders. Only a few years ago, most potatoes were sold for table use. Now, the greater part of the Idaho crop goes into processed potato products. Cooperative research developed the Shoshoni variety, which fills the need for a high-yielding round russet potato with good processing characteristics for dehydrated products.

The plant breeder's job is a continuing one. As his knowledge of plant physiology, genetics, and disease increases, he finds new sources of desirable characteristics to incorporate in improved varieties. There's likewise the need to adapt crops more fully to the growing conditions of a specific area. Vale barley, for example, is especially suited to the irrigated valleys of eastern Oregon.

The plant scientist is constantly improving plants so they can be produced more efficiently. The development of the monogerm hybrid sugarbeet is undoubtedly one of the most dramatic success stories. Starting with a single plant with the single-seed characteristic, observed in Utah in 1948, scientists had bred an experimental hybrid by 1955. Now monogerm hybrids are grown almost exclusively in the major sugarbeet areas. The days of "stoop" labor in the beet fields are about over.

We are making encouraging progress toward development of hybrids in other crops. Last summer Federal and State scientists in Kansas and Nebraska perfected a technique for producing hybrid wheat seed. Now we have the opportunity to determine whether the benefits of hybrid vigor, familiar in other crops, can also be obtained in wheat. We also have a new technique that seems to remove one obstacle in hybridizing oats.

Our program to produce stripe rust-resistant wheats for the Pacific Northwest has been expanded. Some of the experimental crosses made at the Aberdeen Station look promising. Our scientists have also made marked progress toward oat varieties with resistance to barley yellow dwarf disease.

The crop breeding research effort is benefiting both the irrigated and dryland crop areas of the Snake River Valley. And this laboratory should help fill the gap in our knowledge of the best moisture-conservation methods for the cropland above the irrigated valleys. We expect to intensify our research on tillage methods for restricting erosion and controlling weeds -- particularly cheatgrass.

Stockmen here in the Northwest are interested in more intensive use of the foothill rangelands, and our scientists are supplying valuable information on management of the more productive grasses -- particularly crested wheatgrass -- that they are seeding where the sagebrush is removed.

For example, studies of the growth pattern of crested wheatgrass suggest that it may be profitably managed two ways. It may be grazed throughout the spring season until no more forage remains. Or spring grazing may be terminated in mid-May to stimulate regrowth. Then, after this crop has been produced, livestock may be turned onto the grass again. The two-crop system yields only about 70 percent as much forage, but provides grazing in late summer when the native range has dried up.

Stockmen will also be interested in an experimental hybrid grass that has crested wheatgrass and quackgrass as its parents. This hybrid seems to have the vigor and leafiness of quackgrass and the drought resistance and seed quality of crested wheatgrass. It would provide valuable forage and cover growth on the intermountain ranges.

Our soil and water research at this laboratory can also contribute to the productivity of these rangelands. It can suggest management practices to make the most efficient use of moisture, once we have more specific knowledge of the precipitation and runoff characteristics.

Science is constantly improving the efficiency of livestock management and feeding. An example is an improved method of evaluating the feeding value of forages. The crude fiber content was the basis for classifying forages for 100 years. Now, painstaking laboratory research shows that the amount of a specific component of the fiber in forages is highly correlated with digestibility. The procedure is already in use in some commercial forage-testing programs.

A study of the lifetime milk production records of 450 Holstein cows in Utah helps answer the question of when to breed for the highest milk and butterfat production. Cows that freshened first at 30 months of age had the highest total lifetime production, and those with calving intervals between 13 and 15 months stayed in the herd longest.

Research is also suggesting ways of improving sheep management. Animal scientists at Dubois report that failure to recognize the social order in a flock of sheep may stymie breeding improvement programs. Every sheepman knows that one of the mature rams is always the boss ram. In rapidly improving flocks, the yearlings are often genetically superior to the older rams. Accordingly, improvement of the lamb crop may be hampered if the older boss ram is allowed to run with the ewes.

In some parts of the country, a lamb crop every 6 to 8 months would be more efficient than concentrating lambing in the winter and spring. This isn't practical with present domestic sheep breeds. But we have a start in breeding a strain that will have three lamb crops every two years. Matings are made in April, December, and August, and the lambs are weened in August, April, and December.

We have suggested how research is seeking -- and finding -- solutions to the problems facing agriculture. All of the individual difficulties add up to one overriding problem . . . enabling the farmer to get adequate returns for his efforts, so he can enjoy an income commensurate with other segments of the economy.

To improve his economic position, the farmer must make more efficient use of his soil and water resources. He needs the technology that a modern laboratory can provide. For the first time, we have such a laboratory for the Snake River Valley.

As quickly as we can, we expect to have it fully equipped and staffed. We plan to have a team of 20 to 25 scientists and engineers. The scientists will have specialized knowledge of physics, chemistry, fertility, microbiology, plant physiology, and range conservation. The engineers will be specialists in irrigation, drainage, hydraulics, and hydrology.

With this staff of capable, dedicated scientists . . . with imaginative research leadership . . . with the best equipment obtainable, we have high hopes that this laboratory will be of great value to this immediate area, and to the whole Northwest.

It is with great pleasure that I dedicate this laboratory to those who made it possible.

. . . To our cooperators at the University of Idaho, in the Soil Conservation Service, the Bureau of Reclamation, and the Weather Bureau, with whom we have worked for many years.

. . . To the local people and the Twin Falls and Kimberly Chambers of Commerce, who donated the land for the buildings.

. . . To the Twin Falls Soil Conservation District, which leased the surrounding acreage.

. . . To the Idaho Association of Soil Conservation Districts and the local Chambers of Commerce, who sponsored this program.

With your continued help and support, I am sure the Snake River Conservation Field Station will be one of our most productive research centers.

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